Diet quality indicators associated with early childhood caries prevalence
in children ages 2–5 in the National Health and Nutrition Examination Survey (NHANES)

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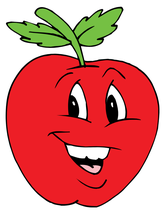
Background

Early childhood caries (ECC) is an insidious form of dental caries that strikes the primary dentition. Dental caries represents the most common chronic childhood disease, 5X > asthma and 7X> hay fever. Diet quality and eating behaviors contribute to early childhood caries prevalence. Consistencies in associations between multiple diet quality indicators and ECC have not been studied.

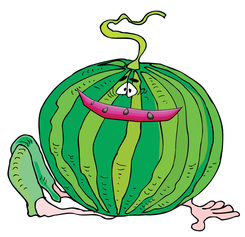
Objective

To examine consistencies between dietary quality indicators and ECC prevalence in children ages 2 to 5 years in the National Health and Nutrition Examination Survey (NHANES).

Methods



The Rao-Scott chi-squared test of independence was used to test for associations between ECC prevalence and diet in NHANES III [1988-1994] (n=4119) and NHANES 2001-2002 (n=801) adjusting for complex survey design for mean Food Pyramid Servings, Healthy Eating Index (HEI), Revised Child Diet Quality Index (RC-DQI) and eating behaviors (meal/snack frequency and soda and water consumption). Significance was established at $p<0.05$. SAS version 9.1.3, service pack 4 was used to perform the analyses.



Results

Table 1
Caries Prevalence by Sociodemographic Characteristics

Characteristic	NHANES III (1988-1994) n	NHANES III (1988-1994) Caries Prevalence (%)	NHANES III (1988-1994) p	NHANES 2001-2002 n	NHANES 2001-2002 Caries Prevalence (%)	NHANES 2001-2002 p[a]
Gender						
Male	2035	23.58	N.S.	393	26.83	N.S.
Female	2084	24.81		408	24.03	
Age						
2	1117	8.55	<0.01	281	8.67	<0.01
3	1006	17.25		195	20.14	
4	1017	30.15		171	35.10	
5	979	39.92		154	41.45	
Race/Ethnicity						
Non-Hispanic White	1160	18.59	<0.01	271	23.14	<0.01
Non-Hispanic Black	1293	28.48		217	29.67	
Mexican American	1460	39.83		220	38.55	
Other	206	35.99		93	17.17	
Body Mass Index Percentile						
< 85th percentile	3064	23.53	N.S.	522	24.27	<0.05
85th - <95th percentile	444	26.75		97	26.38	
≥ 95th percentile	341	23.02		80	44.99	
Dental Visit[b]						
Regular visit in the last year	-	-	-	287	28.28	<0.01
Other visit in the last year				54	79.89	
Not in the last year				460	16.20	
Dental Visit						
> 1 year ago	67	29.23	<0.01	-	-	-
In the last year	860	18.89				

[a] As determined by Rao-Scott Chi-squared test of independence
[b] The dental visit variables were different in NHANES III and NHANES 2001-2002

Table 2
Components of the Food Guide Pyramid Servings

Food Pyramid Servings Component	Serving Size	NHANES III (1988-1994) Mean ± SEM[1] for Children without ECC n = 2744	NHANES III (1988-1994) Mean ± SEM for Children with ECC n = 1167	NHANES III (1988-1994) p	NHANES 2001-2002 Mean ± SEM for Children without ECC n = 580	NHANES 2001-2002 Mean ± SEM for Children with ECC n = 221	NHANES 2001-2002 p
Egg	oz equiv.[2]	0.26 ± 0.02	0.33 ± 0.03	<0.05	0.22 ± 0.02	0.38 ± 0.05	<0.05
Lean meat from meat, poultry, fish	oz equiv.	2.21 ± 0.07	2.66 ± 0.07	<0.01	2.14 ± 0.12	2.63 ± 0.25	<0.05
Vegetables – total (including potatoes)	cup equiv.	1.74 ± 0.05	2.00 ± 0.09	<0.01	0.73 ± 0.04	0.88 ± 0.06	<0.05
Whole grain	oz equiv.	0.88 ± 0.03	0.73 ± 0.06	<0.05	0.53 ± 0.05	0.43 ± 0.05	<0.05
Fruit - other	cup equiv.	1.18 ± 0.06	0.89 ± 0.10	<0.01	0.83 ± 0.04	0.65 ± 0.08	<0.05
Fruit - total	cup equiv.	1.78 ± 0.08	1.44 ± 0.10	<0.01	1.30 ± 0.08	0.96 ± 0.10	<0.01
Dairy - milk	cup equiv.	1.64 ± 0.03	1.46 ± 0.05	<0.05	1.90 ± 0.09	1.50 ± 0.12	<0.01

[1] SEM is abbreviation for Standard Error of the Mean
[2] equiv. is abbreviation for equivalents

Table 3
Components of the Revised Child Diet Quality Index (RC-DQI)

RC-DQI Component Maximum	Scoring Scheme (based on ideal intake)	Maximum Score for Component	NHANES III (1988 1994) No ECC Mean ± SEM[1] (n=2744)	NHANES III (1988 1994) ECC Mean ± SEM (n=1167)	NHANES III (1988 1994) p	NHANES 2001-2002 No ECC Mean ± SEM (n=580)	NHANES 2001-2002 ECC Mean ± SEM (n=221)	NHANES 2001-2002 p
Whole Grains	My Pyramid	5	1.90 ± 0.06	1.47± 0.09	<0.01	1.37 ± 0.11	0.92 ± 0.10	<0.05
Fruit	My Pyramid	10	6.39 ± 0.16	5.51 ± 0.30	<0.01	5.88 ± 0.32	4.59 ± 0.39	<0.05
Excess Juice***	12 ounces	10	7.70 ± 0.13	8.80 ± 0.12	<0.01	7.58 ± 0.20	8.56 ± 0.16	<0.01

[1] SEM is the abbreviation for Standard Error of the Mean
*** A higher Excess Juice score indicates lower intake/closer adherence to guidelines for juice intake.
See Kranz S et al., A diet quality index for American preschoolers based on current dietary intake recommendations and an indicator of energy balance. J Am Diet Assoc 2006; 106:1594-1604.

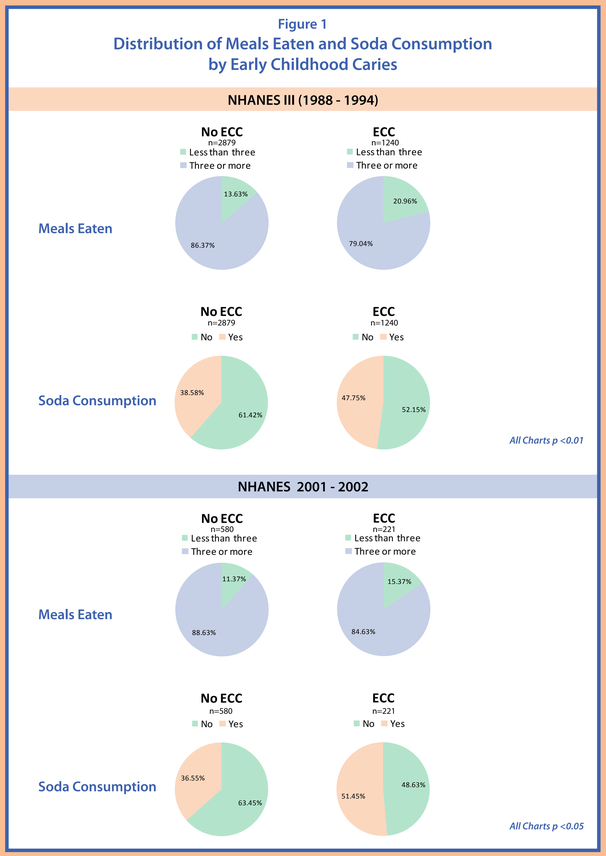
Note: All results adjusted for complex survey design.

Table 4
Healthy Eating Index (HEI) Scores

HEI Component	Criteria for Maximum Score of 10	Criteria for Minimum Score of 0	NHANES III (1988-1994) Mean HEI Score ± SEM No Caries n= 2744	NHANES III (1988-1994) Mean HEI Score ± SEM Caries n=1167	NHANES III (1988-1994) p	NHANES 2001-2002 Mean HEI Score ± SEM No Caries n=580	NHANES 2001-2002 Mean HEI Score ± SEM Caries n=221	NHANES 2001-2002 p
Grain	6–11 servings[1]	0 servings	7.89 ± 0.07	7.42 ± 0.13	<0.01	8.19 ± 0.12	7.56 ± 0.20	<0.05
Fruits	2–4 servings	0 servings	6.29 ± 0.16	5.19 ± 0.29	<0.01	6.52 ± 0.29	5.11 ± 0.41	<0.05
Cholesterol	≤ 300 mg	≥ 450 mg	9.00 ± 0.10	8.61 ± 0.13	<0.01	9.16 ± 0.09	8.39 ± 0.28	<0.05
Total HEI[2]	Sum of components	-	70.64 ± 0.49	67.61 ± 0.59	<0.01	72.72 ± 0.99	68.20 ± 1.36	<0.05

[1] serving of Grain, Vegetables, Fruits, Milk, and Meat for children ages 2-3 reduced to 2/3 the portion for older children and adults
[2] A total HEI score > 80 is considered having a 'good' diet; 51-80 'needs improvement'; less than 51 'poor'

Figure 1
Distribution of Meals Eaten and Soda Consumption by Early Childhood Caries



Results (Cont.)

Diet quality scores, food servings, and eating behaviors that were significantly associated with ECC prevalence in both NHANES III and NHANES 2001-2002 indicated that children with ECC: (1) Consumed significantly greater Food Pyramid Servings of eggs, lean meat from meat, poultry, and fish and total vegetables (including starchy vegetables); significantly less whole grain, total fruit, other fruit and milk; (2) Had significantly lower HEI total, grain, fruit and cholesterol scores; (3) Had significantly lower RC-DQI whole grain and fruit scores; significantly higher excess juice score (indicating lower intake); and (4) Ate fewer than 3 meals daily and drank soda compared to those without ECC.

Conclusion

Specific diet components and poorer dietary quality indicators were consistently associated with a greater likelihood of ECC in young children in both NHANES III and NHANES 2001-2002. Nutrition, dental and medical professionals could reduce children's ECC risk by providing guidance to caregivers of young children to improve diet quality, especially promoting whole grains and fruit. This research identifies a need to develop a Diet Quality Index specific for early childhood caries prevention.